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आँख और चेहरे फव्वारे और
संयोजन इकाइयाँ — विशिष्टि
(पहला पुनरीक्षण)

Industrial Emergency Showers,
Eye and Face Fountains and
Combination Units — Specification
(First Revision)

ICS 13.100

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FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Occupational Safety and Health Sectional Committee had been approved by the Chemical Division Council.

This standard was first published in 1982 to meet the growing awareness of emergency showers, eye and face fountains, combination units.

The *Factories Act*, 1948, and the various Rules framed thereunder require that hazardous chemicals should be expeditiously removed from direct contact with body by taking suitable steps. Especially when a corrosive or irritating chemical affects a vital organ like the eyes, the effects may range from mild irritation to severe burn injuries. In such situations, it is essential that the body and eyes are washed with large volumes of clean water for removal of the chemicals as well as for its dilution. Such flooding with large volumes of water also dissipates the heat generated during a chemical reaction which may take place between the chemical and water. It is essential that in all areas where exposure to such corrosive or toxic chemicals is possible, adequate eye and face protection of proper type is used by the concerned persons. Such protection for eyes, face and entire body can be easily provided by emergency eyewash fountains and emergency safety showers, if they are suitably located and properly designed and maintained.

It should, however, be emphasized that emergency eyewash, shower, and combination units are not a substitute for proper primary protection devices. As a defence against flying solid particles and splashing injurious liquids, workers should wear eye and face protectors and protective clothing.

It is a general practice in many industries to install eye and face wash facilities and emergency safety showers as a combined and integrated unit. However, there are also situations and locations where only eye and face washing facilities or only emergency safety showers would be adequate. Since the basic principle in their use is the same, this standard includes provisions in respect of both the devices.

It is recommended that the delivered water should not be at a temperature that might be expected to discourage the unit's effective use under emergency conditions. A comfortable range is 15 to 35°C. In circumstances, where chemical reaction is accelerated by water temperature, the physician should be consulted for the optimum temperature for application.

Throughout this standard, minimum water capacities have been rated at an inlet supply pressure of 196 kPa (2 kgf/cm²). This inlet pressure, while below that what is normally considered a proper criterion for design, 294 kPa (3 kgf/cm²) has been chosen because of the installation requirements that may find units located at unusual distances from normal supply lines.

The standard is now revised to incorporate new types of Eye/face wash such as , Self-contained eyewash, and Personal eyewash units.

In the preparation of this standard considerable assistance has been derived from the following documents:

Selection and use of eyewash fountains and emergency showers, *Chemical Engineering*. 15th September 1975.

United States of America. Occupational Safety and Health Act. (General Industries Standards applying to eyes stroke face wash fountains and emergency showers).

Use of water in emergency treatment of chemical eye injuries. American Medical Association. Vol. 168, p. 47, September 6, 1958.

ANSI Z 358-1 - 2014 Emergency Eyewash and Shower Equipment. American National Standards Institute, and European Norms EN 15154-1 : 2006.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

INDUSTRIAL EMERGENCY SHOWERS, EYE AND FACE FOUNTAINS AND COMBINATION UNITS — SPECIFICATION

(First Revision)

1 SCOPE

This standard prescribes minimum performance requirements for emergency showers, eye and face fountains, combination units Self-contained eyewash and Personal eyewash units.

2 TERMINOLOGY

For the purpose of this standard, the following definitions shall apply.

2.1 Combination Unit — A unit combining a shower and eyewash, or eye/face wash; and/or drench hose into one common assembly.

2.2 Emergency Shower — A unit that enable users to have water cascading over their entire body.

2.3 Emergency Shower Head — A specially designed head for use on an emergency shower.

2.4 Eye/Face Wash — A device used to irrigate and flush both the face and the eyes.

2.5 Eyewash — A device used to irrigate and flush the eyes,

2.6 Flow Pressure — The gauge pressure measured at the pipe wall during flow.

2.7 Flow Regulator — A mechanical device to control the flow of water through pipes.

2.8 Hand Held Drench Hose — A flexible hose connected to a water supply and used to irrigate and flush eyes, face, and body areas.

2.9 Multiple-Spray Shower — An emergency shower using more than one head and delivering water from more than one direction.

2.10 Plumbed Eyewash — An eyewash unit permanently connected to a source of potable water, and meeting the performance requirements of this standard.

2.11 Self-Closing Valve — A valve which closes automatically when released.

2.12 Self-Contained Eyewash — An eyewash that is not permanently installed and must be refilled or

replaced after use, and meets the performance requirements of this standard.

2.13 Stay-Open Valve — A valve which has to be manually closed.

3 LOCATION

3.1 Emergency face/eye wash fountains and showers or combination units shall be located in all areas where there is a possibility of chemical splash injury to eyes or face or body, or exposure to irritating chemicals. These facilities shall be located in such a way that they do not pose a problem by reaction with water sensitive chemicals and shall be so arranged that there is no obstruction in going from the work spot to their location.

3.2 The facilities shall be located at a convenient place. As far as possible, they should be within a distance of 15 m from the place of work.

3.3 Proper drainage system shall be made for quick disposal of used water.

4 EMERGENCY SHOWERS

4.1 Basic Design

4.1.1 The emergency safety shower (*see* Fig. 1) should wash the entire body surface with large volumes of water in the shortest possible time. This device essentially differs from an ordinary domestic shower in its capacity and manner of delivering water.

4.1.2 Emergency showers are generally of two designs, namely, overhead single dome type, and multiple nozzles spray type.

4.1.3 Because of the required deluge action, water pressure head for the emergency shower shall be not less than 196 kPa (2 kgf/cm²) and the total water delivered from the shower or the spray nozzles shall be not less than 76 l/min. The emergency showers may be actuated by a step-on foot valve which may be of the self-closing type, or hand-operated self-closing or stay-open type which may be operated by a chain or pull rod.

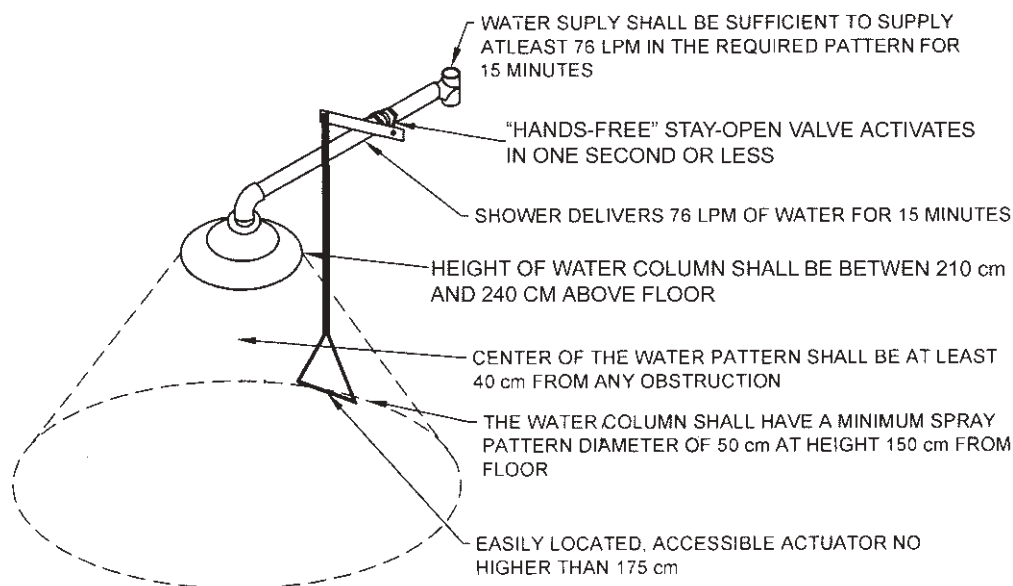


FIG. 1 EMERGENCY SAFETY SHOWER

4.1.4 The shower should be operated by gravity flow of water and hence is not considered ideal for cleaning of eyes.

4.1.5 The overhead shower dome should preferably be provided with means to introduce even peripheral dispersion of water in a cone to cover a large area while ensuring the deluge action.

4.1.6 Water to the shower and washing facility shall be clean and of potable quality. In addition to the filter elements suggested in the eyewash heads, suitable capacity filter should be installed in the main inlet line to the washing facility. Such filters shall be regularly checked and renewed at least once a month.

4.1.7 The eyewash fountains and showers shall be made from corrosion-resistant materials. This aspect shall be looked into to ensure proper maintenance and repairs. The encased components shall be made from such materials as would not lead to internal corrosion and choking of the pipeline and fittings.

4.1.8 A multiple spray shower may be provided with 15 - 20 spray nozzles suitably located to direct flow of water from head to foot from all sides. The spray nozzles shall be designed so as to deliver a flow rate not less than 76 l/min at 196 kPa (2 kgf/cm²) without harsh jets or misting. The water cone shall have vortex angle of 45°.

4.2 Performance

4.2.1 Shower Head

Emergency shower head shall be so designed that a water column of height 210 to 240 cm is provided from

the standing level. The water column shall have a minimum spray pattern diameter of 50 cm at 150 cm height from the standing level and the centre of the spray pattern shall be located at least 40 cm from any obstruction or emergency. Shower head shall be so designed that it produces a straight water column. Emergency shower head shall be capable of delivering a minimum of 76 l/min of water, which shall be substantially dispersed throughout the pattern.

4.2.2 Control Valves

The valves shall be designed in such a manner that the water flow remains 'on' without requiring the use of the operator's hands. The valve shall be capable of remaining activated until intentionally shut off. The valve shall be simple to operate and go from 'off' to 'on' in less than or equal to 1 s. The valve shall be corrosion-resistant to potable water.

4.2.3 Valve Actuator

Stay-open or self-closing actuators shall be easily located and readily accessible to the user.

4.3 Installation

The unit shall be connected to a potable water supply capable of delivering not less than 76 l/min by the method shown in the manufacturer's instructions.

4.4 Testing

4.4.1 Connect a flow meter to the shower to be tested, or provide other means of measuring water flow. Connect the unit to a flushing water supply at a flow pressure of 196 kPa (2 kgf/cm²). Open the valve of the emergency

shower. Determine that the flushing valve is substantially dispersed throughout the pattern. The flushing water column pattern shall be at least 210 cm and not more than 240 cm from the surface on which the user stands. Measure the diameter of the flushing water pattern at 150 cm above the surface on which the user stands. The diameter shall be minimum 50 cm throughout the 15 min test; verify that the flow rate is a minimum of 76 l/min.

4.5 Maintenance and Training

4.5.1 Showers and spray nozzles shall be checked at least once a week to ensure proper functioning. They shall be activated daily to flush the line and to verify proper operation.

4.5.2 Individuals shall be instructed in the proper use of emergency showers.

5 EYE/FACE WASH FOUNTAINS

5.1 Basic Design

5.1.1 Eye/Face wash fountains (*see* Fig. 2) are usually provided with a pair of eyewash heads and a receptacle for collection and drainage of spilled water. It shall be capable of operation by either a self-closing or a stay-open valve. The advantages of a stay-open valve are that the water flow is uninterrupted and the injured person is free to use both the hands to have better irrigation of the eyes.

5.1.2 Each eye/face wash head shall be provided with a built-in particulate filter as well as suitably designed atomiser or without such arrangement, for ensuring soft flow and even dispersion of water.

5.1.3 Eye/Face wash fountains shall be connected with a source of clean and cool water supply at a pressure head of approximately 196 kPa (2 kgf/cm²).

5.1.4 Eye/Face wash heads shall be provided with built-in pressure and combined flow compensation so as to regulate the flow of water at the eye/face wash heads at approximately 12 l/min.

5.1.5 Eye/Face wash heads shall be so designed or oriented as to give a combined flow of water covering both the eyes/face. The centre to centre distance between the eye/face wash heads should be 140 to 200 mm approximately.

5.2 Performance

5.2.1 A mechanism shall be provided to assure that a controlled flow of potable water or its equivalent is provided to both eyes/face simultaneously at a low enough velocity so as not to be injurious to the user.

5.2.1.2 There shall be no sharp projections anywhere in the operating area of the unit.

5.2.1.3 Nozzles shall be protected from airborne contaminants. Whatever method is used to afford such protection, the removal shall not require a separate motion by the operator when activating the unit.

5.2.1.4 Eye/Face wash equipment shall be capable of delivering to the eyes not less than 12 l/min for a period of 15 min.

5.2.1.5 The unit shall be designed in such a way as to provide enough room to allow the eyelids to be held open while the eyes are in the water stream.

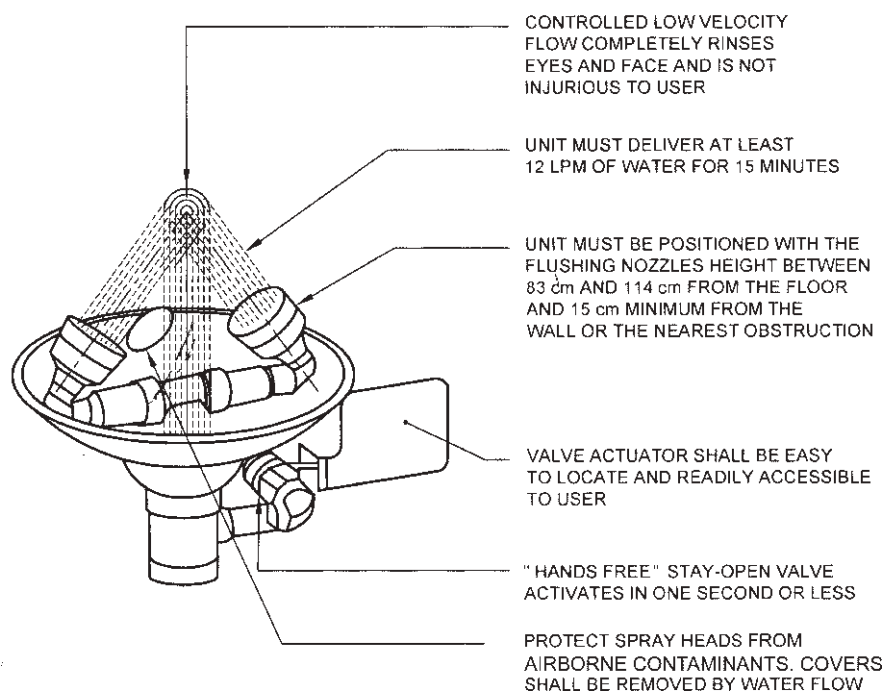


FIG. 2 EYE/FACE WASH FOUNTAIN

5.2.2 Control Valves

The valve shall be designed in such a manner that the water flow remains on without requiring the use of the operator's hands. The valve shall be capable of remaining activated until intentionally shut off. The valve shall be simple to operate and go from 'off' to 'on' in 1 s or less. The valve shall be corrosion resistant to potable water. The valve actuator shall be large enough to be easily located and operated by the user.

5.3 Installation

Upon installation, operate valve and determine that both eyes are washed simultaneously at a low enough velocity so as not to be injurious to the user.

5.4 Testing

5.4.1 Connect a flow-meter to eyewash to be tested, or provide other means of measuring water flow.

5.4.2 Attach the plumbed unit to a water supply line at 196 ± 10 kPa (2 kgf/cm^2) flow pressure.

5.4.3 Open the valve on the eye/face wash unit. Verify that it opens till 1 s and stays open.

5.4.4 Using the flow meter or other means, determine that the rate of flow is at least 12 l/min and that the flushing

streams wash both eyes/face simultaneously at a low enough velocity so as not to be injurious to the user.

5.5 Maintenance and Training

5.5.1 Eye/Face wash units shall be checked periodically for the free flow of water and checked for unobstructed passages. Functioning of the pressure compensating devices shall also be checked periodically. Unit shall be activated daily to flush the line and to verify proper operation.

5.5.2 Individuals shall be trained in the proper use of emergency eyewash units.

6 SELF-CONTAINED FACE/EYEWASH

6.1 Basic Design

6.1.1 Self-contained Face/Eyewash fountains are basically water containers of suitable capacity made of anti-corrosive materials provided with a pair of eyewash heads. Eyewash shall be designed to provide enough room to allow the eyelids to be held open by hands while the eyes are in the flushing water stream (see Fig. 3). Eyewash shall be designed, manufactured and installed in such a manner that once activated, they can be used without requiring the use of operators' hand.

6.1.2 Both the flushing nozzles should deliver a soft

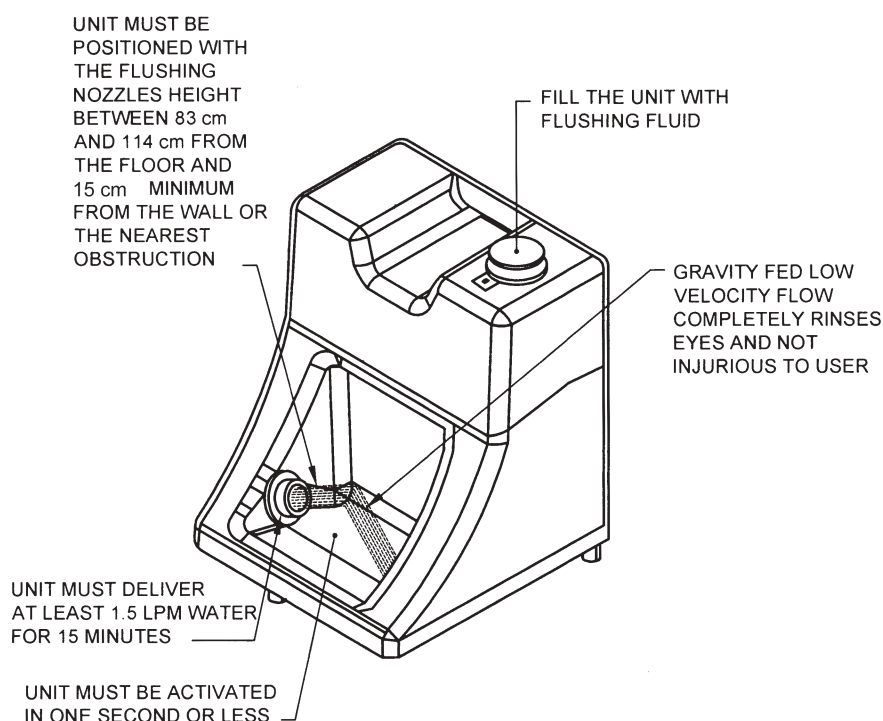


FIG. 3 SELF-CONTAINED FACE/EYEWASH FOUNTAIN

flow of water at a rate not less than 1.5 LPM for a period of 15 min.

6.1.3 The flushing nozzles shall be positioned at a height of not less than 83 cm and not greater than 114 cm from the surface on which the user stands and 15 cm minimum from the wall or the nearest obstruction.

6.2 Performance

6.2.1 Self-Contained Eyewash Fountain

6.2.1.1 A mechanism shall be provided to ensure that a controlled flow of potable water or its equivalent is provided to both eyes simultaneously at a low enough velocity so as not to be injurious to the user. There shall be no sharp projections anywhere in the operating area of the unit. Nozzles shall be protected from airborne contaminants.

6.2.1.2 The unit shall be capable of delivering water to the eyes and face at a rate of not less than 1.5 LPM for a period of 15 min. The unit shall be designed in such a way as to provide enough room to allow the eyelids to be held open while the eyes are in the water stream.

6.3 Testing

6.3.1 Set the unit as per manufacturer's instructions. Fill the unit with water or with pre-packed fluid provided by the manufacturer or the user's physician. Activate the unit and verify that it can be activated in 1 s or less. Throughout the 15 min test, ensure that the eyewash is capable of delivering a minimum of 1.5 LPM using a stop-watch and measuring jar.

6.4 Maintenance and Testing

6.4.1 Unit shall be checked at least once a week to ensure proper functioning. It shall be activated daily and refilled up to the level. Water in the container should be replaced weekly if no additive is added.

6.4.2 Self-contained eyewash shall be visually checked to determine if the flushing needs to be changed or supplemented.

7 COMBINATION SHOWER AND EYEWASH OR EYE/FACEWASH FOUNTAIN

7.1 Performance Requirements for Combination Units

Combination units (*see* Fig. 4) shall be designed so

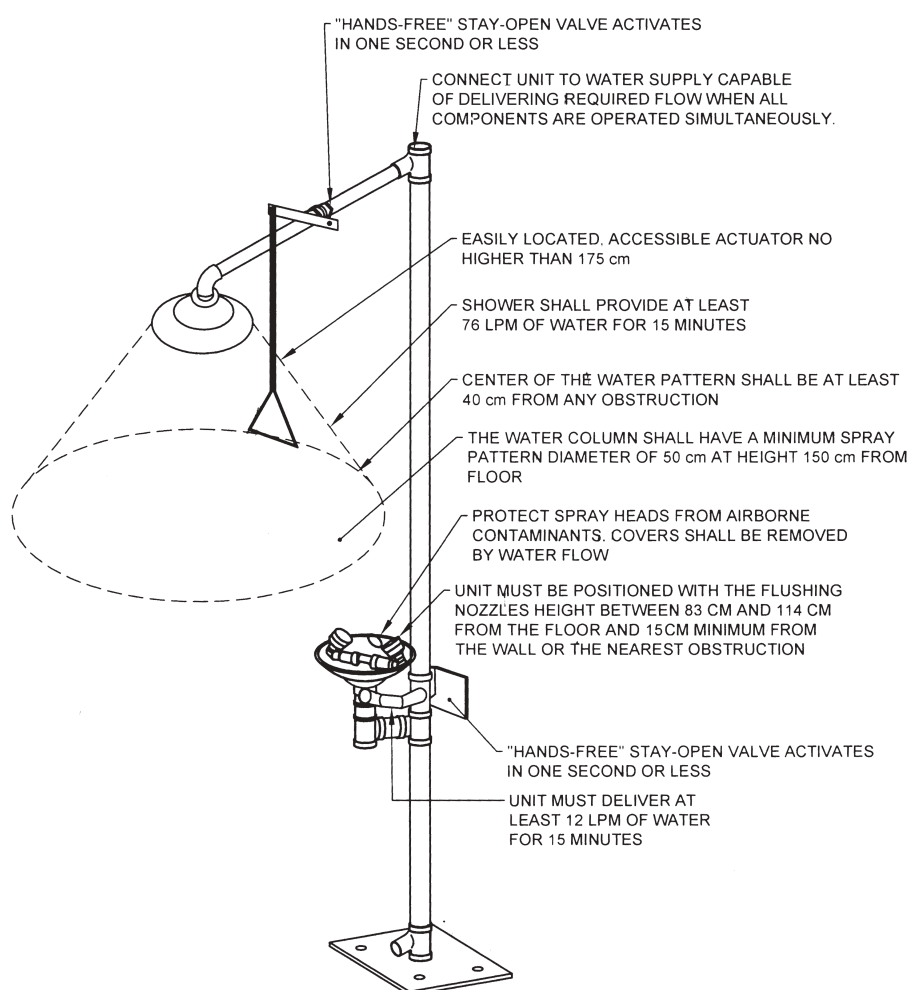


FIG. 4 COMBINATION SHOWER AND EYEWASH

that all components can be operated individually from a common fixture supply line. Showers shall meet performance requirements of 4. Eye/Facewash units shall meet performance requirements of 5. Self-contained Eye/Face wash units shall meet performance requirements of 6.

8 MARKING AND PACKING

8.1 Marking

8.1.1 Each emergency shower, Eye/Face fountain, Self-contained Eye Wash Fountain and Combination unit shall be marked with manufacturer's name or recognized trade-mark if any, designation and any other mark of identification desired by the purchaser.

8.1.2 BIS Certification Marking

The product may also be marked with the Standard Mark.

8.1.2.1 The use of the Standard Mark is governed by the provisions of *Bureau of Indian Standards Act, 2016* and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

8.2 Packing

Each emergency shower, Eye/Face fountain, self-contained eye wash fountain and combination unit shall be packed as agreed to between the purchaser and the supplier.

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Amendments Issued Since Publication

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